Amendments to the Claims

The listing of claims below replaces all previous versions of the claims in this application.

1-17. (cancelled)

18. (original) A method of estimating velocity ahead of a drill bit disposed in a subsurface region, comprising:

obtaining surface seismic data for a region of interest;

during drilling of a borehole traversing the subsurface region, determining a travel time of a seismic wave generated from a surface of the region to a location in the borehole when the drill bit is at selected depths in the borehole;

determining a velocity from the travel time and the selected depths; and

inverting the surface seismic data to determine a velocity ahead of the drill bit while constraining velocity between the surface and the drill bit to be consistent with the velocity determined from the travel time.

19. (original) The method of claim 18, further comprising transforming the velocity ahead of the drill bit into pore pressure of a region ahead of the drill bit.

20. (original) The method of claim 18, wherein the seismic wave is generated by a seismic source positioned near an opening of the borehole.

21. (original) The method of claim 18, wherein determining the travel time of the seismic wave comprises detecting the seismic wave from at least one seismic receiver at a location in the borehole.

22. (original) The method of claim 21, wherein the seismic receiver is disposed in a downhole tool near the drill bit.

23. (original) The method of claim 21, wherein determining the travel time further comprises measuring the arrival time of the seismic wave detected at the seismic receiver and determining the travel time from the arrival time.

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24.   (original) The method of claim 23, wherein measuring the arrival time comprises sending the seismic wave detected in the borehole to the surface and processing the detected seismic wave at the surface to determine arrival time.

25.   (original) The method of claim 23, wherein measuring the arrival time comprises processing the seismic wave detected in the borehole to determine the arrival time and sending the arrival time to the surface via telemetry.

26.   (previously presented) A method of estimating velocity ahead of a drill bit disposed in a subsurface region, comprising:

generating seismic waves from a surface of the region when the drill bit is disposed in a borehole traversing the subsurface region;

obtaining seismic wave data associated with the surface generated waves at one or more locations in the borehole; and

inverting the obtained seismic wave data with surface seismic data obtained for the region to determine a velocity ahead of the drill bit.

27.   (previously presented) The method of claim 26, further comprising transforming the determined velocity into pore pressure of the subsurface region.

28.   (previously presented) The method of claim 27, wherein the surface seismic data is obtained for the subsurface region before the borehole is formed in the region.

29.   (previously presented) The method of claim 27, wherein the surface seismic data is obtained for the subsurface region after the borehole is formed in the region.

30.   (previously presented) The method of claim 27, wherein the surface seismic data is obtained for the subsurface region during drilling of the borehole in the region.

31.   (New) A method of estimating velocity ahead of a drill bit disposed in a subsurface region, comprising:

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generating seismic waves from a surface of the region when the drill bit is drilling subsurface formations in a borehole traversing the subsurface region;

obtaining seismic wave data associated with the surface generated waves at one or more locations in the borehole during the drilling; and

inverting the obtained seismic wave data with surface seismic data obtained for the region to determine a velocity ahead of the drill bit.

32. (New) The method of claim 31, further comprising transforming the determined velocity into pore pressure of the subsurface region.

33. (New) The method of claim 31 wherein the generating seismic waves is performed according to a predetermined sequence and the obtaining seismic wave information is performed correspondingly to the predetermined sequence.

34. (New) The method of claim 31 further comprising determining seismic travel time from a position of the generating seismic waves to the one or more locations in the borehole, the seismic travel time determined by processing the obtained seismic wave data in a processor in the borehole.

35. (New) The method of claim 31 further comprising determining seismic travel time from a position of the generating seismic waves to the one or more locations in the borehole, the seismic travel time determined by transmitting detected seismic wave data to the surface from within the borehole.

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